

## CLAIMS:

What is claimed is:

1. A semiconductor device, comprising:  
a silicon (111) single crystal substrate;  
an epitaxial boron phosphide (BP) comprising layer on said substrate, and  
a group III-nitride semiconductor epitaxial layer on said BP layer.
2. The device of claim 1, wherein said BP layer is a single crystal.
3. The device of claim 1, wherein said group III-nitride layer comprises GaN.
4. The device of claim 3, wherein said GaN layer is single crystal.
5. The device of claim 1, wherein said buffer layer has a thickness in the range of  
0.1 –1.0  $\mu\text{m}$ .
6. A light-emitting diode (LED), comprising:  
a silicon (111) single crystal substrate;  
an epitaxial boron phosphide (BP) comprising layer on said substrate;

a group III-nitride semiconductor epitaxial layer on said BP layer, and  
an active layer comprising  $\text{In}_x\text{Ga}_{1-x}\text{N}$  on said group III-nitride layer.

7. The LED of claim 6, wherein said BP layer is a single crystal.
8. The LED of claim 6, wherein said group III-nitride layer comprises GaN.
9. The LED of claim 6, wherein one terminal of said LED is contacted through said silicon substrate.
10. The LED of claim 6, further comprising a first and second cladding layer sandwiching said active layer.
11. The LED of claim 6, wherein said active layer comprises  $\text{In}_x\text{Ga}_{1-x}\text{N}$ , wherein  $0 \leq x \leq 1$ .
12. A method for forming group III-nitride articles, comprising the steps of:  
providing a single crystal (111) silicon substrate,  
depositing an epitaxial boron phosphide (BP) comprising layer on said substrate,  
and  
depositing an epitaxial group III-nitride semiconductor epitaxial layer on said BP

13. The method of claim 12, wherein said BP layer is a single crystal.
14. The method of claim 12, wherein said group III-nitride layer comprises single crystal GaN.
15. The method of claim 12, further comprising the step of *in-situ* removal of native oxide on a surface of said Si substrate in a reactor used for depositing said BP prior to depositing said BP.
16. The method of claim 15, wherein said *in-situ* removal comprises hydrogen reduction.